REMARKS

Applicant has canceled claims 1-3, amended claims 4 and 8, and added new claims 15 and 16. Accordingly, only claims 4-5, 8, and 14-16 remain in the application. Of the remaining claims, claim 14 was allowed, but none of the other remaining claims 4-5, 8 and 15-16 were allowed.

Claim 4 was rejected as obvious over Wilke (5,970,199) in view of Guigne (4,924,449), Raudsep (3,673,555), and Thompson (US reg. H1490). Claim 4 describes a system for sensing regions at and close under a sea floor, such as shown, for example, in applicant's Figs. 1 and 2. A vehicle (e.g. 16) supports a row of sonic transducers (T1, T2, etc.), and at least one sonic detector (D1). Circuitry connected to the transducers energizes them one at a time to produce pulsed sonic beams, each pulse containing a carrier frequency of at least about 200 MHz that is modulated. The vehicle supports the row at a height (H) above the seafloor of no more than six meters, and the vehicle can move the row along a path above the seafloor. The height enables the carrier frequency to be eliminated in water so only the lower modulation frequency remains, and results in a lower modulation frequency in the form of a narrow beam.

Wilke describes an underwater surveying system with transducers 28 that create sonic pulses and separate sensors 30 that detect echos. His Fig. 1 shows a boat pulling his array 12 high above the seafloor. He describes his array being pulled either along the sea surface or below the surface where wave action is reduced or eliminated (col. 2, l. 17-19), but does not describe pulling his array close to the seafloor so that his beams have not spread out to thereby obtain an image of the seafloor which is of high resolution.

Guigne suggests a lower carrier frequency of about 100 kHz, which does not provide high resolution. In his column 7, line 57, he suggests a carrier frequency of 95 kHz. A casual statement of a "minimum carrier frequency f_c of around 100 kHz", with an example of 95 kHz, does not anticipate the advantage of every frequency above that, especially when he teaches the use of a carrier frequency of 95 kHz.

Raudsep describes a system with a beacon (10 in his Fig. 1) on the seafloor, that transmits signals to help an oil drilling ship position itself. He transmits a carrier wave of 40 kHz modulated by a signal of 0.72 kHz. His system is not relevant to probing the seafloor to determine its characteristics. MPEP 2141.01 (a) states that to rely on a reference under Rule 103, it must be analogous prior art. An engineer trying to design a better system for high resolution probing of the seafloor, would not turn to Raudsep's system for navigating an oil drilling ship.

Thompson describes towing a cable with a seismic source that generates strong waves that penetrate deep into the seafloor to detect oil deposits, the cable supporting an electromagnetic detector for detecting electromagnetic fields generated by the seismic waves. Thompson's system is very different from applicant's, in that Thompson is not concerned about converting a high frequency modulated pulse into a narrow beam that penetrates a small distance below the seafloor, and with sonic echoes detected by a sonic detector. Thus, the art of Thompson is art that is not analogous to the present invention under MPEP 2141.01 (a). That is, an engineer trying to develop a system for sonically probing the seafloor with high resolution, would not turn to Thompson's system for generating seismic waves to probe deep under the seafloor. Thus, a combination of the references does not anticipate claim 4.

Claim 5, which depends from claim 4, describes a sonic detector adjacent to each sonic transducer of a row and between two transducers. None of the references show a row of sonic detectors, with each sonic detector lying adjacent to a sonic transducer and between two transducers.

Claim 8, which was rejected on Wilke, describes apparatus for sensing characteristics of regions at and under a seafloor, which includes an array of transducers that generate sonic beams and an array of sonic detectors. Circuitry is connected to the transducers to energize them one at a time to generate a narrow sonic beam. The sonic detectors include at least three detectors interspersed with the transducers, with a plurality of detectors lying between two transducers. In Wilke, his transducers and detectors are not interspersed. That is, Wilke's Fig. 2 shows three rows of transducers 28 and three separate rows of sensors or detectors 30. His detectors 30 do not lie between two transducers.

New claim 15, which is similar to now-canceled claim 2, describes a vehicle that tows an array of transducers along a path no more than six meters above the seafloor, while energizing them one at a time with a carrier frequency of at least about 200 MHz, modulated by a lower frequency. As discussed above for claim 4, Wilke tows at the sea surface or at a depth of reduced wave action, but not close (within 6 meters) to the sea floor. Guigne suggests about 100 kHz and gives an example of 95 kHz. Raudsep concerns a beacon for navigation, and is non-analogous art.

Yu (5,808,967) measures velocity or distance in two dimensions to measure water currents, rather than the characteristics of the (stationary) seafloor. He energizes his transducers simultaneous to form each beam (col. 4, lines 45-48),

rather than energizing the transducers one at a time. Also, he produces a narrow beam by close control of the simultaneous energization of transducers, rather than by using a high carrier frequency with a lower modulation frequency, and relying on the dissipation of the high carrier frequency to leave a low frequency beam with small spread angle.

New claim16, which is similar to now-canceled claim 3, describes at least three detectors interspersed with transducers, with a plurality of detectors each lying between two transducers. Wilke's three separate rows of transducers 28 and his three separate rows of sensors or detectors 30, is not a showing of transducers and detectors interspersed with each other, and none of his detectors 30 lies between two transducers.

In view of the above, favorable reconsideration of the application is courteously requested. If the Examiner should wish to discuss the application, he is invited to call Leon D. Rosen at (310) 477-0578.

Respectfully submitted,

L. D. Rosen

Leon D. Rosen
Reg. No. 21,077
Attorney for Applicant

10960 Wilshire Boulevard
Suite 1220
Los Angeles, CA 90024
(310) 477-0578